REMARKS

The application has been reviewed in light of the final Office Action dated October 5, 2007. Claims 1-19 were pending. By this Amendment, claims 1-19 have been canceled, and rewritten as new claims 20-32. New claim 20 is a combination of previous claims 1, 6 and 8; new claims 21-25 correspond to previous claims 7 and 11-14, respectively; new claim 26 is a combination of previous claims 1 and 2; new claim 30 is a combination of previous claims 15, 17 and 8; and new claims 27-29, 31 and 32 correspond to previous claims 3-5, 18 and 19, respectively. Accordingly, it is submitted that the claim amendments do not introduce new subject matter or new issues, and entry of this Amendment is requested. Upon entry of this Amendment, claims 20-32 would be pending, with claims 20, 26 and 30 being in independent form.

Claims 1-5 were rejected under 35 U.S.C. § 102(b) as purportedly anticipated by U.S. Patent No. 5,832,051 to Lutz. Claims 1-19 were rejected under 35 U.S.C. & 102(e) as purportedly anticipated by U.S. Patent No. 6,381,487 to Flohr.

Applicant respectfully submits that independent claims 20, 26 and 30 are patentable over the cited art, for at least the following reasons.

This application relates to various improvements devised by applicant for X-ray CT (computed tomography) imaging, particularly for acquiring an image in the same time phase of a cyclic motion of an imaging subject, caused by the patient's heartbeat and the like.

In an aspect of the present application, a plurality of sample tomographic images having respective different cardiac time phases are reconstructed based on projection data and heartbeat information, an integrated value of a CT value of each of the plurality of sample tomographic images in a predetermined region is calculated, a sample tomographic image with a smallest

fluctuation of the integrated value of the CT value is selected. In addition, a static cardiac time phase corresponding to the selected sample tomographic image is determined, and the subject tomographic image is reconstructed using the projection data corresponding to the above-mentioned static cardiac time phase. Each of independent claims 20 and 30 addresses these features, as well as additional features.

Neither Lutz nor Flohr, as understood by Applicant, discloses or suggests that an integrated value of a CT value of each of the plurality of sample tomographic images in a predetermined region is calculated, and a sample tomographic image with a smallest fluctuation of the integrated value of the CT value is selected.

Flohr, column 5, line 53 through column 6, line 7 (reproduced below), was cited in the Office Action in connection with claim 8 (now-canceled):

> Images 1 through 4 are shown in FIG. 7, these having been reconstructed from the projections n ε $[N_{o,i}, N_{o,i}+N-1]$ with the start projections $N_{o,i}$ (i=1(1)4) marked in FIG. 6. The images demonstrate the significant correlation of the introduced error criterion $\sigma_C(n)$ with the extent of motion artifacts. Image 1 and image 2 show clear double contours of the heart chambers, whereas image 3 and image 4 exhibit hardly any motion artifacts.
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> From the projection interval $[N_1,N_2]$, the resting phase of the heart identified in FIG. 8 by hatching, can be defined from the projection interval n ε $[N_1, N_2+N]$ in the time interval $[T_1\ T_2]=[T(N_1),T(N_2+N)]$. The constants C_1 and C_2 according to (1) are again used for parametrization.
>
> Apart from the automatic analysis of complementary data, an automatic interpretation of reconstructed images is also possible in the scope of the invention. ***When, for example, the differences of images succeeding one another in time exhibit a negligible extent of line artifacts or double contours, these images can be allocated to a resting phase of the heart. An uninterrupted sequence of images evaluated in this way as being low in motion artifacts then defines a resting phase of the heart.***

Thus, Flohr merely propounds that when the differences of images succeeding one another in time exhibit a negligible extent of line artifacts or double contour, such images can be allocated to a resting phase of the heart, and that an interrupted sequence of images evaluated in

this manner as being low in motion artifacts then defines a resting phase of the heart. That is, the approach proposed by Flohr detects the resting phase of the heart by comparing low motion artifacts of the differences of images succeeding one another.

However, Flohr does not disclose or suggest selecting a sample tomographic image with a smallest fluctuation of the integrated value of the CT value.

The approach proposed by Flohr would take longer calculation time to detect low motion artifacts of the differences of images succeeding one another, for example, using block matting process. In comparison, an amount of time for calculating an integrated value of a CT value is small compared with the amount time required for the process proposed by Flohr.

Applicant submits that the approaches proposed by the cited art simply do not disclose or suggest calculating an integrated value of a CT value of each of the plurality of sample tomographic images in a predetermined region, and selecting a sample tomographic image with a smallest fluctuation of the integrated value of the CT value (independent claims 20 and 30 of the present application).

Accordingly, for at least the above-stated reasons, Applicant respectfully submits that independent claims 20 and 30, and the claims depending therefrom, are patentable over the cited art.

In another aspect of the present application, the static cardiac time phase is determined based on correlation data between the heartbeat information and the static cardiac time phase that are previously determined for each subject. Independent claim 26 addresses these features, as well as additional features.

Lutz and Flohr, as understood by Applicant, do not disclose or suggest such feature of claim 26.

Lutz, column 2, lines 18-25 (reproduced below), was cited in the Office Action in connection with claim 2 (now-canceled):

> ***The cycle time of the cardiac rhythm of the patient is determined and setting of the rotation time of the X-ray beam rotating about the patient so that the rotation time is made larger or smaller, by a predeterminable measurement interval, than the cycle time of the cardiac rhythm of the patient, so that, dependent on the rotation time, after a few rotations there is a phase difference of 360 ° between the rotating X-ray beam and the patient's cardiac rhythm.*** A trigger signal containing trigger impulses is generated, which is synchronized with the cardiac rhythm of the patient. Predetermined control signals for the examination of various cardiac phases are generated chronologically displaced in relation to the trigger pulses of the trigger signal. Exposure and storage of measurement data of projections of various cardiac phases take place for the duration of the measurement interval within each rotation of the X-ray beam around the patient. The measurement data of the projections of the respective cardiac phases, exposed and stored at various angular positions during several rotations of the X-ray beam, are combined to form projection groups of a partial or complete rotation. Images of a respective cardiac phase are reconstructed from the measurement data of the projection groups of a partial or complete rotation of the respective cardiac phase, on the basis of the cycle time of the trigger signal, the cycle time of the control signal relative to the trigger signal, and the measurement interval.

Thus, Lutz proposes determining a cycle time of the cardiac rhythm of the patient and setting a time of rotation of the X-ray beam based on such cycle time.

Contrary to the contention in the Office Action, Lutz says nothing whatsoever regarding detecting a ***static cardiac time phase*** based on correlation data between heartbeat information and the static cardiac time phase that are previously determined for each subject.

Flohr, column 2, lines 42-54 (reproduced below), was cited in the Office Action in connection with claim 2 (now-canceled):

> In one version of the invention, for classification of the measured data, the ECG signal of the respective patient is utilized. ***The correlation of the ECG signal with the actual mechanical movement of the heart can, first, ensue with automatic or interactive evaluation of measured data and/or CT images of a reference examination, i.e. a number of test projections, and evaluation of the synchronously acquired ECG signal.*** In this way, the patient-specific delay between R-wave of the ECG signal and the trigger time of the radiator can also be quantitatively acquired for

ECG-triggered CT exposures, leading to a significantly improved imaging and a significantly more efficient examination execution.

Thus, Flohr proposes that evaluating measured data and/or CT images of a reference examination, and evaluating a synchronously acquired ECG signal, to correlate the ECG signal with the actual mechanical movement of the heart.

However, Flohr, like Lutz, does not disclose or suggest detecting a ***static cardiac time phase*** based on correlation data between heartbeat information and the static cardiac time phase that are previously determined for each subject (independent claim 26 of the present application).

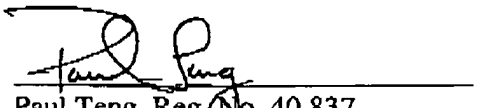
Accordingly, for at least the above-stated reasons, Applicant respectfully submits that independent claim 26 and the claims depending therefrom are patentable over the cited art.

In view of the remarks hereinabove, Applicant submits that the application is now in condition for allowance, and earnestly solicits the allowance of the application.

If a petition for an extension of time is required to make this response timely, this paper should be considered to be such a petition. The Patent Office is hereby authorized to charge any fees that are required in connection with this amendment and to credit any overpayment to our Deposit Account No. 03-3125.

If a telephone interview could advance the prosecution of this application, the Examiner is respectfully requested to call the undersigned attorney.

Respectfully submitted,



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